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West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 2/79)

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WEST EUROPE REPORT

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INTERNATIONAL AFFAIRS

USE OF TOTAL ENERGY MODULE, BIOGAS IN EUROPE DISCUSSED

Paris LE NOUVEL OBSERVATEUR in Franch 24-30 Sep 79 pp 71-73

[Article by Michel Bosquet: "Energy: A 'Totem' for Everyone"]

[Text] It's a machine that is ingenious and simple at the same time, just like the egg of Columbus. Almost two years ago it was already used in the United States. Fiat is going to start commercializing it in France only just this fall. You will see the reason for this slowness.

The machine's name is "Totem" (contraction of Total Energy Module). Quite simple it's a "Fiat 127" 900 cc motor with an oversized cooling circuit, coupled with a 15 kw alternator large enough to supply the 200 electric light fixtures in a large office, the electric installations of a large farm, a small factory, or several homes.

Now here's the trick: instead of using the radiator grill to evacuate the heat produced by all combustion motors and all generators, the "Totem" sends its heat through your central heating system. In sum, it's a generator which is also a heater. It yields 33,000 calories per hour in the form of water at 85°C, which heats an eight room house or four 100 square meter apartments.

Interest in this combination appeared as soon as its energy balance sheet was drawn up. In fact, for every 50,000 calories per hour of fuel that the motor uses, it yields 33,000 in heat and 13,000 in electricity. The loss is eight percent and the overall efficiency is 92 percent, which is a triumph. In fact you should know that individual heating has only a 40 to 65 percent efficiency, that a good boiler, very well regulated, can reach 85 percent, and the best generators yield at most 30 percent of the energy that they consume.

Everything happens as if the "Totem" were a furnace which supplies you with free electricity, or conversely it were a generator, which in exchange for

low efficiency, gives you free heating.* The cost of the system with its duct work is less than Fr 30,000 (about $6,000 in the United States). Its life expectancy is 10 years, operating 10 hours per day. The cost of a guarantee-maintenance contract is Fr 500 per year.

Is it expensive? Is it worth it? And above all, isn't wanting to produce one's own current an absurd idea, one of those ideas of a modern Robinson, of a millionaire ecologist, being what one kilowatt produced by a little generator is "extremely" more expensive than that from a large powerplant?

Well, don't be mistaken! In a "Totem" kilowatt of generated electric power costs less than Fr 2,000, while it is Fr 2,200 to Fr 6,000 in the large coal or nuclear powerplants. From the economic point of view, a nation would do better to use Fr 2 billion to install 66,667 "Totems" for small or moderate consumers, than to supply them from a 100 megawatt nuclear plant, which costs from Fr 3 to 4 billion. That is not counting high tension wires, transformers, and secondary plants which must be in reserve for the possibility of a breakdown. Decentralized production would be able to save the money for all these things.**

An additional advantage is that the mini power plant recovers all the heat which the big plants completely lose be ejecting it into running water, which increases pollution. In fact, each time EDF [French Electric Company] was asked why it did not recover calories lost by the big plants to supply, for example, urban city heating, its spokesman replied that it was not possible. A single large plant, they say, gives off such enormous quantities of heat, that it is impossible to find a consumer large enough to buy and use its calories.*** In other words the heat lost by big powerplants is not recoverable because there is too much of it. With smaller plants (such as "Totem" or middle sized turbines) this disadvantage disappears.

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*That is the principle of combined electricity and low temperature heat production, feasible in both large and small installations. In this way the large plant can furnish five to ten times the amount of heat which would have been produced by the electricity lost as a result of turbine modifications.

**A large American bibliography on the economic superiority of decentralized systems will be found in "Soft Energy Paths" by Amory Lovins (Pelican Books, 1977, chapter 5).

***See the informative debate on this subject by the Trade and Production Commission, 10 May 78, pp 1571-81 of the "Official Journal."

Amortization in Four Years

So "Totem" users are indicated to be all those who need constant electricity and heat at the same time, and must absolutely be protected from current outages; hospitals, laundries, dairies, canneries, paper mills, farms, cabinet makers, etc.

An objection soon comes to mind. Isn't it absurd, in our time, to start an energy production system founded on gasoline? But, in fact, who said that "Totem" uses gasoline? Like all combustion and electric motors it can, with a little modification of the carburator, work as well on ethyl alcohol (United States price from Fr 120 to Fr 180 per litre, depending on its origin), on methanol, on natural gas, or on gas from manure, better known today under the name biomethane. And it's precisely a biomethane installation which Fiat chose to demonstrate the merits of "Totem."

This installation has been in operation for more than a year at the Manfred Steiner farm in Montherod, Switzerland (Vaud canton), using the manure from his 10 cows and 10 hogs. Pulverized first, this manure is fermented in an air-tight insultated 4 cubic meter vat, called the digester. Digesting an average of 2 cubic meters per day, bacteria furnish Steiner an average of 80 cubic meters of biogas, plus 1800 litres of sludge, which is very rich in organic nitrates and is an excellent complete fertilizer.

In fact, thanks to his manure and his "Totem," Steiner produces much more energy than he needs for his winter heating, for drying his fodder in summer, for running his car and tractor, and for producing the necessary electricity for his use. Biogas replaces the 15 tons (18,000 litres) of fuel that Steiner had to buy before, and "Totem" supplies 30,000 kw of electricity in addition to the 20,000 kw which he uses. He sells the surplus (15 centimes per kilowatt) to the local electric company.

Balance: the complete installation cost Fr 105,000. It saves Fr 18000 in fuel and Fr 4,000 in electricity. In addition it brings in Fr 5,000 for the sold electricity, so the investment is amortized in four years and then provides practically free energy to its owner. It remains to be seen whether what is possible in Switzerland is also possible in France.

Jack-of-all-Trades Only

The first condition is that it is necessary to be able to sell electricity. There is nothing to oppose it legally. EDF has the monopoly on current distribution, but not on production. Nevertheless, EDF must agree to buy the current which is offered to it and pay an equitable price. This was not often the case in the past. Small producers (windmill and small water fall owners) have suffered reprisals for months or even years, and if they held out, finally obtained a much lower price for their current than that paid to Steiner in Switzerland. But all that is in the past. We are assured that EDF will in future welcome small domestic producers. Fiat was waiting for these assurances before introducing "Totem" in France.

There remains the installation of a manure digester. There are six or seven million in China, which supply the equivalent of 100 million tons of petroleum per year. India has 36,000 "family" digesters (each one of the manure of from two to five cows); Formosa has 7,500; South Dorea has 27,000 (for eight cows, 23 pigs, or 650 chickens); and Nepal has 100. In the United States the Chicago gas company is linked by pipline to the giant digester in Guymon (Oklahoma), which furnishes it 25,000 cubic meters of biogas daily.

In France the fermentation of methane from farming wastes and stable litter, which are now burned in the fields, could supply the equivalent of a good dozen million tons of petroleum. It seems there exist almost a hundred digesters, but I have never been able to obtain a serious reference with a complete address and performance details. On the other hand, all those who sought to build a digester have returned empty handed after having knocked on all the doors; of INRA [National Institute of Agricultural Research], of COMES, of the Energy Conservation Agency, and of the big water purification experts. The only things that exist are large installations for sewer water treatment (belonging to the city of Paris), or "make-shift" installations by amateurs, with the help of a boiler maker and a mason, following the more or less detailed plans and directions found in ecological publications.* On the other hand its impossible to buy a digester with "immediate delivery" and money back guarantee.

The Actizing Company, an American firm called Europactizyme* in Europe, is trying to fill this gap; in association with the Huber boilermaker industry it built Steiner's installation at Montherod. Nevertheless, it's a "demonstration" model. Specializing in water purification, the Swiss-American firm primarily does consulting-engineering, selling plans and very active bacteria, imported from the United States. It is not capable, either, of supplying an installation with "immediate delivery."

The official thesis in France is quite simply that biogas "isn't perfected" and there must still be "long and careful research" before industry can deliver a digester that is "as clean, automatic, compact, and reliable as a diesel motor." But those who are waiting until this marvel can be put on the market to purchase one, are risking waiting until the end of time. There are two reasons for that.

*See in particular "le Pont," BP 95, 70200 Lure. In the astonishing "Bibliographic Guide to Convivial Tools" of Valentine Borremans, published by Bowker (New York), there are no less than 13 bibliographic references, mostly Anglo-Saxon, on biogas, including a bibliographic work with 416 references.

**39, rue de Lausanne, Lausanne.

First, methane fermentation installations do not depend on only one industry, or even two or three, but on boiler making (for the storage vats), masonry (for the fermentation vat), electronic construction (for the regulative apparatus), mechanical construction (for the compressor), plumbing (for the pipe work), and last and most important agriculture, preferably biological, for the manure supply, which must be free from antibiotics and chemical pesticides which could stop the proliferation of the methane generating bacteria.

In short, no industry combines all the necessary skills; no one has an interest in making biogas installations. Moreover, suppose there were a firm which specialized in installing this type of equipment; it could not give a "money back" guarantee any more than a dairy stables builder can guarantee the performance of the cows, or a coop builder can guarantee the performance of the chickens. And that is for the simple reason that the primary ingredient, the manure, is a living ingredient which industry can neither produce, nor standardize, nor guarantee.

That explains why at present biogas production is more advanced in some agricultural societies than in the superindustrialized countries, and within the former, more used among small or medium sized traditional users than among large chemical users. It interests the peasant, not the industrial trust or agro-industry.

Without doubt, that will change in 10 years; the big industrial purification experts will construct big factories where the bacteria, cultivated and sold by laboratories, will daily digest their thousand tons of wastes, gathered from a radius of a dozen kilometers. Then the biogas will be piped into gaslines linking the country to the consumption centers. Centralization will have taken over once again.

At least we now know that it's not always technically necessary for things to be that way. The usefulness of a system like "Totem" is to demonstrate in concrete terms that small decentralized production units can be more efficient and more economical than large. The primary obstacle to their increase in number is political. For decentralization and the degree of autonomy, even cooperative management, that it affords interests only the common people. They are not the ones, at present, who make the political and technical choices.

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INTERNATIONAL AFFAIRS

CURRENT STATE, FUTURE OF ARIANE PROGRAM OUTLINED

Plans for Production, Organization

Paris AIR & COSMOS in French 24 Aug 79 pp 40-41

[Text] On 25 and 26 July the board of directors of ESA approved the long-term supply order for a second lot of five new series-produced "Ariane" rockets, on top of the six already in production; this will bring to 11 the operational "Ariane" boosters ordered so far (not including the four flight test rockets).

The board of directors also approved the start of the supplementary "Ariane" development program in order to increase the payload in an earth-stationary orbit from 1.7 to 2.35 t by 1982-1983.

Nine out of the eleven council member states furthermore approved a resolution in favor of the creation of a company--Transpace--for the industrial production and sale of the "Ariane" booster, as proposed by France. The details of the project will be reviewed during a special ESA council meeting on 10 and 11 September.

The first flight-test launch of the "Ariane" rocket (L01) was postponed slightly to the start of December 1979.

"L-SAT" and "MARECS C" Satellites

The board also adopted a resolution on the development of a new European satellite, the L-SAT" which will be a "heavy platform" optimized for the "Ariane" rocket--but possibly compatible with the "Shuttle"--with a multimission payload (direct TV, etc.) whose definition will be assigned to a British project manager. A decision will be made in autumn 1980 regarding the manufacture of the "L-SAT" satellite intended for flight demonstration by the end of 1983 or the beginning of 1984. Five member countries of the ESA have already decided to finance the "L-SAT" program whose cost has been estimated at between one hundred and one hundred and twenty million accounting units: United Kingdom, 37.5 percent; Holland,

25 percent; Italy, 25 percent; Switzerland, 7.5 percent; and Denmark, 5 percent.

The board of directors handling the telecommunications programs of ESA also met on 26 July and decided on advance financing for the third European maritime communications satellite, the "MARECS C" whose launch is scheduled for February 1982. A contract covering about 25 million UC [accounting units] will be awarded to British Aerospace for the construction of "MARECS C" which will henceforth be an integral part of the ESA offer to the INMARSAT (International Maritime Telecommunications Organization via Satellite). This offer calls for the "direct" supply (no longer via Eutelsat) of three "MARECS" satellites for a total price of $84 million, everything included, over a period of seven years.

Plans for Longer Term

Paris AIR & COSMOS in French 1 Sep 79 p 35

[Text] A long-range study on the long-term (10-year) evolution of French space effort will be submitted to the board of directors of the CNES [National Center for Space Studies] in autumn; the organization's role was enlarged to include the examination of French space policy guidelines.

Cryogenic Engine "HM 60"

An important part of that study will in particular deal with the long-term development of the European "Ariane" rocket. The CNES--project manager for the "Ariane" project--in effect proposed the development of a "Ariane family" which would, by 1990, produce the powerful multipurpose booster "Ariane 5,: The two-stage "Ariane 5" rocket would include a first stage of 180-200 t of storable rocket fuel (UDMH and N2 04), a derivative of the current stage, and a new second stage, a cryogenic stage (liquid hydrogen plus oxygen) with a very powerful engine, the "HM 60," with a th ust of 60-80 t, which should be developed by the SEP [European Propulsion Company]. "Ariane 5" could thus launch 8 t of payload into a low earth orbit or place close to 5 t into an earth-stationary transfer orbit --instead of the current 1.7 t. The cost of developing this new rocket would be somewhere between F5 and F10 billion.

CNES Prefers "Minos" to "Hermes"

The "Ariane 5" rocket is also designed to launch the supersonic, manned and recoverable lifting body under the "Hermes" project of the CNES (see AIR ET COSMOS, No 771). But the CNES is now more inclined toward totally automated (unmanned) systems) such as the shuttle and orbital system of the "Minos" project (see AIR ET COSMOS, No 772) which would also use an "Ariane" rocket.

Preparations for First Launch

Paris AIR & COSMOS in French 15 Sep 79 p 42

[Article by Pierre Langereux: "Will First Ariane Be Launched On 7 December?"]

[Text] The first launch of the European "Ariane" rocket at the Guyana space center is now scheduled for around 7 December, according to the results obtained very recently during the qualification tests of the first two stages and the engines of the three stages of the booster. The first "Ariane" rocket (L01) has just left Le Havre this week headed for French Guyana where it will arrive at the end of September.

Checking Out the "Viking" Engine

The fifth and sixth checkout firing of the "Viking 5" engine for the first stage has just been accomplished successfully on 10 September on the test benches of SEP at Vernon. The engine worked under standard conditions for 175 sec; this in particular made it possible to check out the modifications made in the engine in order to replace the turbopump bearings in accordance with the series definition. This firing thus qualifies the "Viking 5" engine for the first stage in the flight configuration, as well as the "top portion" turbopump and combustion chamber) of the "Viking 4" engine for the second stage which uses a curved deflector. However, considering the two tests performed earlier --in May and July--by SEP with the new curved deflector, the "Viking 4" engine for the second stage can also be considered to have qualified. As of now, the tests of the turbopumps and the "Viking" engines in all configurations total more than 27,000 sec of operations in 337 firings, including more than 1,000 sec of operation for the group of four engines in the first stage.

Qualification of First and Second Stages

The qualification of the first stage will be accomplished after the second, long-duration firing scheduled for 13 September. A first long-duration qualification firing was accomplished successfully in mid-May 1979 and another short-duration test was successful at Vernon early in September.

The qualification of the second stage in the flight configuration was accomplished in March 1979, after the two long-term qualification firings required by the project manager (CNES). But a new series of four firings is scheduled between the end of September and mid-October 1979 to test the effectiveness of modifications in the operating sequence and the vibration-control devices intended to filter vibrations that are harmful to the payload during the cutoff of the second-stage engine.

Qualification of Cryogenic Engine and Third Stage

The qualification of the "HM7" cryogenic engine for the third stage is now scheduled for February 1980, after two series of bench firings, one of them featuring seven firings of the engine in the ground test configuration and another series of six or seven firings of the cryogenic engine with altitude simulations to be performed starting early in October 1979. But the complete qualification of the "HM7" liquid hydrogen and oxygen engine will be accomplished at the end of March 1980 with a new series of prefirings in the flight configuration, carried out after the engine vibration tests.

Next we have the checkout of the third cryogenic stage of the "Ariane" rocket, to be performed by mid-April 1980, after a series of five checkout firings involving the entire power plant in the flight configuration, to be carried out at Vernon, starting in January 1980.

The final tests on the third-stage power plant were resumed in June 1979, after a modification of the test bench, following the incident in November 1978 (engine explosion). The SEP thus performed two new final checkout firings, one of them with standard duration, on 3 July, with a power plant in accordance with the flight configuration. Two more firings are scheduled for 19 or 20 September and the end of October 1979, prior to the first launch of the "Ariane" rocket. Although these are not formally qualification firings, the configuration of these power plants is sufficiently representative to visualize the satisfactory operation of the third stage of the rocket during the first flight tests in Guyana.

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FEDERAL REPUBLIC OF GERMANY

RECYCLING OF WASTE FOR ENERGY, RAW MATERIALS PROPOSED

Hamburg STERN in German 11 Oct 79 pp 31-32, 36

[Report by Sebastian Knauer]

[Text] This weekend the people of Bonn will have to forego their Sunday rest. For the up-to-now largest demonstration of opponents of nuclear power in the FRG the Federal Association of Citizens' Initiatives for the Environment (BBU) expects tens of thousands in the federal capital on 14 October. No subject agitates politicians and citizens as much as the question of how future energy requirements will be met. Industry is waiting for the construction permits for a dozen nuclear reactors which have been blocked as the result of citizens' protests, the Christian Democrats, together with the unions, are swearing to the safety of the jobs in the nuclear industry. The FDP minister for economics, Graf Lambsdorff, disparages opponents of nuclear power as "political subculture," the Social Democrats, finally, with a clear "Yes and No" are so far dodging a clear-cut decision regarding the election campaign issue of nuclear energy.

Researchers specializing in the use of waste, who last week held an international Recycling Congress in Berlin, are now offering a surprising way out of the energy dilemma. The solution: waste. The 18 million tons of household waste of the citizens of the FRG annually produce precisely as much energy as is to be produced by the existing and planned atomic power plants.

"We should have written waste programs 10 years ago, not atomic programs," says Guido Brunner, the EEC commissioner for energy, who wants to make use of an up-to-now neglected raw material and energy potential through "recycling" and the reuse of raw materials. In the densely populated areas, the waste of large towns, with its increasing share of synthetic products of the throw-away age, already has the heating value of brown coal. Brunner: "We could cover 2 percent of total energy requirements from waste." Our future lies in the garbage can.

At the same time, the Germans are already world champions in recycling. More than 1,000 experts from 26 countries gathered information from the

waste experts in Berlin concerning the progressive combustion and gasification technologies in the FRG, through which energy and valuable raw materials can be regained. In every ton of dirt there is the equivalent of 300 liters of the best heating oil.

Synthetic products like the yogurt cup are a model of material and energy waste. The career of this assembly line product, which has become a symbol of the throw-away society, must be attributed not only to the profit orientation of industry but also to the consumer who has become accustomed to convenient packaging. The course of life of every single yogurt cup will cost dearly in the future. Its weight is 7.5 grams, the wall strength 2 millimeters, the material is polystyrene, a synthetic which is made from petroleum. Furnished with a colorful imprint of the dairy industry, from pineapple to lemon, the cup is filled with 150 grams of yogurt. The best years of the career cup last only the few days to the end of the stamped-on date of freshness.

Produced in seconds and spooned out in a few minutes at the breakfast table, it finds its way to the garbage. Here there is no expiration date, for in the waste deposit the plastic cup is nearly indestructible. It does not rot, it does not get mouldy, bacteria which eat away at it are being searched for by scientists--thus far in vain. Only after 25,000 years the yogurt cup, which was carelessly thrown away, begins to dissolve. The oldest amphorae, into which the Greeks poured their wine, are barely 2,500 years old. The yogurt cup developed in the fifties will survive its models by many thousands of years. In 1978 alone, 4.3 billion cups were produced in the FRG at a cost of 4 pfennigs each--and thrown into the garbage.

Every citizen of the FRG today produces 6 hundredweights of waste a year, almost double the amount of only a decade ago. This household waste of the FRG, with a volume of 80 million cubic meters, if brought together, would produce a mountain as high as the Zugspitze, with the base as large as several soccer fields. At the same time, private households account for less than one-tenth of the total filth of the nation, according to data compiled by the Federal Office for the Environment for the first time in 1977. Automobile wrecks, old tires, construction rubble, but also sludge from sewage treatment plants, slaughterhouse wastes and poisonous special refuse from industry add up to an annual waste yield of over 220 million tons.

And this mountain of waste contains the raw materials of the future. Every ton of household waste contains about 14 percent glass, 23 percent paper and cardboard, 18 percent synthetics, leather, rubber, and 5 percent metals. Including pure gold. The extremely thin coatings of the precious metal on gift packages contain a treasure not yet dug up. A cubic meter of waste from a large town, according to analyses of American waste researchers, contains more gold than a cubic meter of the ores from which it is produced. The Christmas and Easter waste probably still more. But just as in the case of silver, that finds its way to the garbage can in used photographic materials, the recovery of gold up to now has proved to be too expensive.

DM 500 Million End Up in Refuse Every Year

In every ton of household waste, however, there are always reusable raw materials for DM 27, according to the calculations of Prof Heinz Hoberg of the Aachen Technical College. Only 10 percent of household waste are really unusable refuse such as construction rubble, ceramic components and ashes. Thus, every year materials costing about DM 500 million are thrown away.

"Our primary materials industries will recover the raw materials they need from waste in 20 to 30 years," says Josef Vogel of the Bavarian Ministry for the Environment. Alone, in the straw which is burnt in the fields of the FRG after the harvest every year, there is as much energy as in 1 million tons of oil. The sparing handling of natural resources, which at the same time means less wasteful exploitation of nature, anyway is being demanded in the environmental program of the federal government: "Waste products, more than up to now, must be reintroduced into the raw material production cycle at the lowest possible cost."

Recycling--the fashionable slogan comes from the United States, which was also the point of departure of the ecological movement--already forms the bridge between waste pile and material requirements in the case of many raw materials.

In the FRG this year approximately 1.5 million automobile wrecks are being discarded; lined up they would extend from Frankfurt to Hongkong. The scrap metal dealers cope with this sheet metal avalanche by means of modern shredding installations which in 30 seconds hammer every vehicle into fist-size pieces. Iron and steel parts are sorted out with magnets and reused as high-grade scrap metal. Every second ton of steel is already being recovered from scrap metal.

The former Krupp-boss Ernst Mommsen: "In the industry we will make the basic rules of the cycle of nature one of the guiding principles of our industrial philosophy."

In the paper industry, recycling existed when this word had not yet been invited. Today a total of 15 million trees are left standing because about 45 percent of the scrap paper in the FRG is reused by the paper factories. An example shows what this means: For every ton of new paper, 15 trees are felled. Calculated in these terms, the 60,000 tons of telephone books of the German Post Office, which become obsolete every year, constitute an entire local recreation area.

Recycling here is especially important because the reproduction of wood does not keep up with consumption. By 1990, according to a calculation of the United Nations, twice as much wood will be consumed worldwide as today. The German forestry, which at the present time could still meet the demand for wood of the paper and cellulose industry--without the cheap

imports from Scandinavia and Canada--without any problem, foresees a deficit of 100 million cubic meters of wood by the year 2000.

With regard to paper and cardboard, to be sure, the recycling-conscious Germans now occupy first place in the world by a margin. Every third ton of new paper is now being produced from scrap paper.

In the case of glass, too, the industry demonstrated foresight in good time. In a letter to the federal government, dated 1 July 1971, (re: Protection of the Environment), the Federal Association of the Glass Industry introduced a change in course. The producers assured the government that "they would give the further use of the advertising slogan 'out and away with it' as a contribution to the solution of the pressing environmental problems."

The jolly saying, it is true, had already caused enough damage: In the years 1967 to 1971 the number of no return bottles sold increased from 43 million to 980 million. Federal Minister of the Interior Gerhart Rudolf Baum wants to obviate this packaging waste completely, which is produced with a high expenditure of energy. Thus the old milk bottle, which has fallen into oblivion for the past 20 years, is to be used once again. Baum: "The end of the throw-away age has arrived."

The end of the plastic age, however, has not yet come.

The production of plastics in the FRG still doubles every 4 to 5 years. In household waste, the share of plastics already amounts to 15 percent of the volume. By 1990 automobiles could be built predominantly out of plastics; today about 7 percent of every vehicle consists of plastics.

The waste-processing industry nevertheless does not have to worry about its future. Almost unnoticed by the public, work has been proceeding for years in the Institute for Inorganic and Applied Chemistry of the University of Hamburg on a recycling installation for plastics. Today, the most stubborn problems of the plastic age--including the previously indestructible yogurt cup--can already be reprocessed into raw materials in the experimental installation.

In a red-hot fluidized bed of sand, the original components are separated in the pyrolysis process and such valuable petrochemical primary materials as toluene, naphthalene, and benzol are recovered. The pioneer project is already operating with a profit. Not lastly because the price of chemicals like toluene has tripled in a few years. As a kind of substitute for lead, toluene eliminates knocking in gasoline.

"When we began with the project, we were accused of engaging in waste removal, not science," recalls institute director Prof Walter Kaminski, who invested 10 years of research in plastics waste. Today a commercial plant is being built in the port of Hamburg at a cost of DM 20 million, which to begin with will convert about 6,000 tons of used tires, which

Daily Trash

Food and kitchen waste (30%)

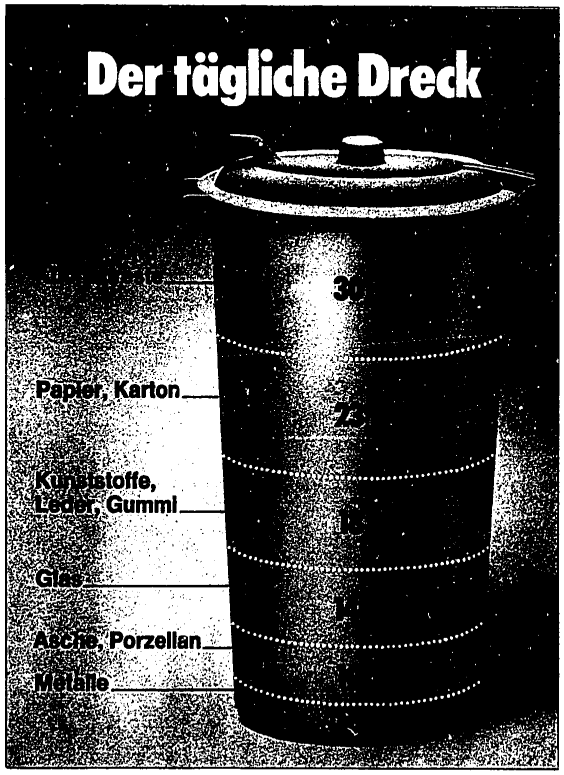
Paper, cardboard (23%)

Synthetics, leather, rubber (18%)

Glass (14%)

Ashes, porcelain (10%)

Metals (5%)



Limitless Growth: Each FRG Citizen Produces 6 Centners of Waste a Year

annually accumulate in the Hanseatic town, into raw materials, using the pyrolysis process. To date 35 million tires disappear annually in the FRG in garbage dumps or--painted white--as flower beds in front yards. In the best of cases, they hold down the covers over the fodder supply of farmers.

Methods for the better utilization of waste were not developed by the large enterprises whose subventions run into the millions. Medium-size enterprises and amateurs first had to develop progressive recycling processes before industry recognized the new market. Thus it took a decade before the Swabian tinkerer Karl Keiner from Goldshoefe was granted DM 5 million by the Federal Ministry for Research and Technology for the development of a waste gasification model. His pyrolysis process, for which the Saudis have already requested patent rights, turns waste into energy.

In a pilot project, the waste of 120,000 inhabitants in Aalen and Heidenheim will soon be turned into electricity and district heating for approximately 60,000 households. Every kilogram of household waste contains about 8.4 million joules of usable energy for heating.

Although in the FRG there are already 44 waste incinerators feeding electricity and hot steam into the municipal networks, more than two-thirds of the household waste are still being deposited in the countryside, with attendant damage to the environment. According to calculations by the "Club of Rome," which last week held its annual meeting in Berlin, individual raw materials, such as copper, tin, and nickel, will soon be exhausted if the present waste continues. For the industry-oriented futurologists, modern society stands at the crossroads between "chaos and a brilliant future" if man fails to preserve the natural environment. And for Erhard Eppler, the environmental expert and land chairman of the Baden-Wuertemberg SPD, energy is "the key question in an ecological policy for the 1980's."

According to his calculations, the FRG can do without the expansion of nuclear energy if there is success in saving energy and developing alternative sources of energy. This includes, among other things, the waste which stands in grey cans in front of the house door. We can count on it.

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FEDERAL REPUBLIC OF GERMANY

SWISS AUTO ENGINEER'S NEW COMBUSTION CHAMBER DESCRIBED

Hamburg STERN in German 13 Sep 79 pp 240-243

/Article by Peter Behse/

/Text/ Swiss engineer Michael May has developed and tested an engine that is a economical as a diesel, but as speedy as a gasoline engine. But his invention is not in demand in the German automobile industry.

At a speed of 150 km on the autobahn the measuring device indicates gasoline consumption of 8.86 liters per 100 km. When the speed is 130 km it shows 6.82 liters, and on the highway the average consumption is even as low as 5.49 liters. In city driving only 6.8 liters pass through the carburetor.

The automobile in which these fabulous values were measured is a Ford Fiesta with a 1.6-liter engine with 78 hp. The secret of this miracle engine is in the cylinder head and sounds a little like James Bond: Fireball. Michael May, a Swiss graduate enginner, has applied for a patent on a new combustion process under this name. Simply stated it combines the techniques of the diesel engine and the gasoline engine. The gasoline-air mixture is compressed in a round combustion chamber and is made to become extremely turbulent. May's combustion chamber is one-third smaller than in traditional engines. Therefore, the mixture burns faster and more evenly than otherwise.

In the Fireball process there is a series of advantages. Because of the good mixing and the rapid combustion in the small combustion chamber, there is scarcely any tendency to ping or knock. The May engine can compress to a very high degree. Our test-Fiesta devoured premium gasoline without complaint with a compression of 12.8. Normally, engines start to knock at 9.8.

Total combustion means good utilization of the energy in the gasoline, thus little in the way of exhaust gases, and lower consumption. This engine starts quite normally, reacts spontaneously to the accelerator, revs up vigorously and in so doing is no louder, but also no quieter than its cousin in the Ford line. It already meets the stricter laws on exhaust gases which will take effect in 1982.

Although the May engine, on the average, swallows 22 percent less gasoline than the series engine, interest on the part of the German automobile industry in the invention is surprisingly small. In 1975 the inventor from Geneva had given his first Fireball automobile over to the Volkswagen /VW/ factory for testing. That was in the form of a VW Passat with gasoline injection. Measurements in Wolfsburg confirmed the data of the inventor: on the average, the Passat used 24 percent less gasoline with the May cylinder head. The VW engineers take their Swiss colleague quite seriously, too--yet Germany's largest manufacturer of automobiles has shown no further interest in the Fireball. In Wolfsburg people are of the opinion that "there are solutions which appear to be superior to Mr May's." The engineers at Mercedes are impressed by the economy of the Fireball car, but feel that the emission of hydrocarbon gases is too high. Dr Lange, head of engine development at BMW /Bavarian Motor Works/, says: "The engines which we are just now in the process of developing are better."

May reveals understanding of this attitude by the German companies: "No experimental division likes to concede that a loner--and a Swiss, at that-- has found the solution to an engine problem, a solution that thousands of experimental engineers have been seeking in vain thus far."

In May's opinion, in the eyes of these engineers engine construction is a German domain. "After all, the two forefathers of the combustion engine, Nikolaus Otto and Rudolf Diesel, come from Germany."

Yet May grew up at Daimler Benz and Porsche. After completing his thesis--the topic was gasoline injection for which he also holds several patents--he worked at Mercedes in the development division for injection engines. At the end of 1960 Porsche was looking for an engine designer who would be able to help get more power into the formula-1 racing engine. Michael May managed to change companies overnight.

At Porsche the Swiss made only a brief guest appearance. But it was enough to raise the 1.5-liter racing engine from 145 to 186 hp. The wrangling about authority made the work so difficult for May that he left the sportscar shop in Stuttgart. He went to the competition and got the Ferrari engines ready for the formula-1-world championship in 1964. The thanks of the Commendatore was expressed with a golden Ferrari medal.

After that May opened his own engineering office which fills development orders from the automobile industry. In 1969 the first engines with turbocharging for street use were also developed. Today, the May Turbo is still good business in its own factory.

The Fireball idea took shape in 1974. May wants to design better engines for normal consumers rather than more engines for racers. The most important goal at that time was fewer harmful exhaust gases without adding complicated equipment to the engine. This is most easily and successfully accomplished by

combustion of the gasoline-air mixture that is as complete as possible. It just sort of happens in passing that such an engine is also especially economical.

May's first experimental engine, the injector in the VW Passat, is still running today trouble-free--the car has gone 104,000 km. "Since this engine has gasoline injection, the whole world claims that the Fireball process operates without a carburetor. In order to prove the opposite I have re-equipped the Fiesta."

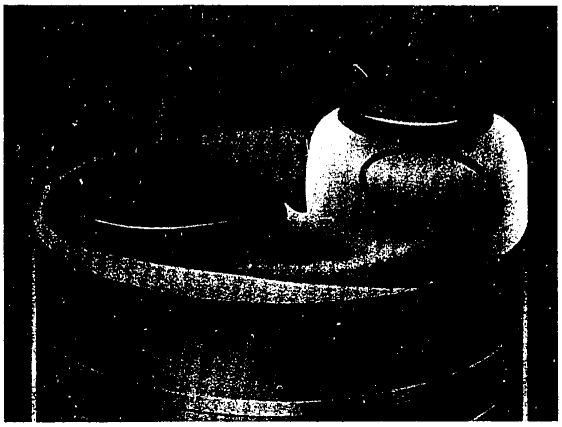
Until now he has put about 1 million Swiss francs into the Fireball. "The same development would cost ten times that in an automobile factory." May works with two men and his wife Christina, 40, who is the mother of a daughter and is responsible for the finances of the company.

Mrs May has been driving the Fireball-Passat for years and gives assurances that she has no difficulties with it. Only the many measuring devices in the experimental car bother her. Her husband says: "The fact that my wife manages the car proves how foolproof the system is."

Option agreements have meanwhile been made with the inventor of the Fireball by 14 manufacturers of engines for automobiles, airplanes and boats. Agencies are likewise interested in the project. Richard Hurn of the U.S. Department of Energy is the third U.S. official to learn the Fireball process, on the shores of Lake Geneva. Hurn, responsible for optimal energy utilization, says: "We have been watching May's work for some time now. The new car is very impressive. We will wait the first test results with bated breath."

Production costs, according to Michael May's calculations, are no higher than for conventional engines. Molding and working tools for the cylinder heads must be constantly replaced anyway--natural wear and tear. The shift in production from the normal engine to a Fireball engine could be done very easily during a company's vacation period.

The prestigious English firm Jaguar will probably be the first to offer the economic engine a la May. The large six-and Twelve-cylinder engines are particularly in need of the economy-cure, primarily in respect to export to the United States and the rigorous regulations in force there on exhaust gas and consumption.



Caption:

The secret of May's Fireball system is in the cylinder head. The gasline-air mixture is made turbulent by the piston during the compression cycle with high speed from the intake valve (left) into the dome-shaped combustion chamber under the exhaust valve. The result is even mixing which burns cleanly.

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FRANCE

PIONEER IN RECOMBINANT GENETIC RESEARCH DESCRIBES WORK

Paris LE NOUVEL OBSERVATEUR in French 8 Oct 79 pp 70-73

[Interview with Professor Pierre Chambon, director of the research laboratory at the Strasbourg Medical School, by Gerald Doumith; time and place of interview not given]

[Text] Are scientists about to uncover the "new terrorists" of our time? After the atom-smasher, is it the manipulator of genes who is preparing for us a fearful future? In the investigation by Josette Alia on "The Biologists' Great Fever" (LE NOUVEL OBSERVATEUR, No 776,

24 September), researchers were already defending themselves against that accusation. This week we give the floor to Professor Pierre Chambon, one of the pioneers in French genetics, who directs the research laboratory of the Strasbourg Medical School and appears on our list of "50 Unknowns who are the Future."*

[Question] How does one become a researcher?

[Answer] As a child I wanted to be a surgeon the way others want to be firemen. So I started in medicine, then quickly realized that I wasn't cut out to occupy myself with sick people and decided to return to more scientific studies. I worked in a biochemistry laboratory and that fascinated me. That was it, the modern adventure. There was nothing more to explore on the earth, it was necessary to explore something else--the living cell, for example. But at that time in France we were at our lowest ebb, because the war had completely disconnected us from American research. The only center where they were doing modern biology and biochemistry in the 1950's was the Pasteur Institute, and I wasn't there. So I trained on the job, making many mistakes. Then in 1966 I spent a year at Stanford in California, in the biochemistry lab, which is without a doubt one of the best in the world. There I learned many things, about organizing research, among other things. When I came back here in 1967 I started with a small team.

[Question] What is your daily life like in your laboratory?

[Answer] I arrive at the lab at 0800, I leave at 2000. At present there are about 30 researchers in the lab. Instead of directing I spend about a third of my time on administrative problems. That is too much. We are subjected to a stifling administration that doesn't know the problems. For example, all of our financing operates under a priori control; it is impossible to change the budgetary appropriation, to pay a person out of a budget intended for a centrifuge. Well, research today moves very fast, it has to be able to adapt very rapidly. They often talk about the mobility of researchers, but what should also be made more mobile are the means given to us. I for one would really like the people who are occupied with research on the bureaucratic level to have spent several months in a lab, to see what the problems really are. That would be more useful to us than having decisions totally foreign to daily life in a laboratory landed on us. Having said that, what is my role? I collect the money, I organize and I mainly discuss--daily with some researchers, less often with others because they are "mature" researchers. My work is essentially organization. By definition the researcher is very individualistic, his sensitivity is a little like an artist's, he is someone who has to prove that what he does is worthwhile. He is continually judging himself and he is very sensitive to the way his work is received by others. So, to have a correctly functioning lab it is necessary to know how to handle impassioned people, it is also necessary to persuade some of them to collaborate, to encourage them--

*LE NOUVEL OBSERVATEUR No 777.

[Question] Are you a tyrannical boss?

[Answer] My role is to decide, when there are several options, which is the best. I always surround myself with opinions, but at a given moment I decide entirely alone. One can, one must use people's opinions, but research can't be done in total democracy. Look at the CNRS [National Center for Scientific Research], INSERM [expansion unknown], the University; it's democratic and very respectable, but how heavy-handed it is! As for self-managed research, that's definitely impossible. It would be unproductive to try to apply everyone's ideas. One is obliged to define the main lines.

[Question] And your authority is never contested?

[Answer] In research, authority doesn't exist. You can't command a researcher to research. The influence you may have on him is based on the respect he has for you--or for your work.

[Question] What is at stake in the research you direct?

[Answer] To comprehend, in molecular terms, what the mechanisms of development and differentiation are. How a being evolves, from its insemination to the time it becomes an adult in possession of all its cells, all its tissues.

[Question] That's the generality. But the immediate stake?

[Answer] To understand why in certain pathologic cases, differentiation escapes from the normal process. Why a cell escapes from control and becomes cancerous. But it would really be difficult for me to explain to you, technically, what we are going to be working on in the next six months. Let's say that we are trying to delimit the results of a discovery made two years ago, which is that the genes of animal cells, eucaryotes in general, are in pieces. What does that mean in relation to regulation?

[Question] What is there in biology that is not quite resolved?

[Answer] Basically two things: the problem of the nervous system, of the brain. And the problem of development biology. This is still completely open, for the next 20 or 30 years. I think one can reasonably hope to have understood how an organism develops between now and--yes, 20 to 30 years.

[Question] And what will be its practical applications?

[Answer] Maybe the phenomena of carcinogenesis, of malformations, will be understood. Or even more things, thanks to new techniques of genetic manipulations. But application isn't the business of a basic research lab, be it at CNRS or INSERM or the University. That's the domain of industry. If industry believes it is of interest to make insulin in bacteria by genetic manipulation, it is up to industry to develop the laboratories in which it is to be done. We can transfer the technology, train the people, advise the manufacturers. But not substitute ourselves for them. France is in a bad

situation today, because molecular biology has not interested industrialists at all for a very long time. They did not see the interest and actually, for the short term there were no immediate applications. But they were wrong for the long term because ultimately genetic engineering was one of the results of molecular biology. I hope they have now understood, and that they are going to create basic research laboratories in industry. If they had done that, they wouldn't have missed the first three years of genetic engineering and they would not be outdistanced, as they are, by the Americans and the Japanese.

[Question] Have you not sometimes had the impression that you were handling miniature bombs with your genetic manipulations?

[Answer] No more than the people who did the research on the atom. You know, it isn't the scientists who decide what is going to be done with science. It's the companies, the governments, the policies that are playing with fire, not we. Manipulations are no more dangerous in the end than the policy of a government that would decide, for example, to systematically mate intelligent people in order to produce a superior, more intelligent race. In fact, genetic engineering may be excellent or have disastrous consequences, depending on the use to which it is put. And that belongs to policy, not science. All that can be asked of us scientists is that we not pollute the atmosphere, that we not let loose pathogenic bacteria into nature. The rest is beyond us. Progress always has two faces. That's no reason to be reactionary!

[Question] As a man, how do you judge yourself?

[Answer] As a pure product of French education. As an intellectual who likes to handle ideas--that's typically French, I believe--, who has inherited the serious side of French education, the notion that there is nothing above intelligence, that the only interesting games are the games of the mind. But at the same time I have a creative side. I create in research as I would have created in industry, had I been an industrialist. To build a research group is creating in creation, in a way. It fascinates me.

[Question] They say you work in the American way. What does that mean?

[Answer] That means 12 hours a day. You can get researchers to accept that if you motivate them, if you give them interesting work. From that moment they believe it is worthwhile to work a great deal, because they get pleasure from it. There are other criteria, too. When people come here to work, I always ask them if their health is good, if they are well-adjusted. They have to be, because one may work for years without knowing whether or not the idea is a good one, and sometimes it takes great strength of character to continue. It is also necessary to stop from time to time, not to become a biochemical animal. But if we want to go farther, I believe we still have many other things to learn from the Americans. Research in France, for example, suffers from a lack of international confrontation. For a very long time France has lived behind customs barriers for industry, reputation barriers for research. We are a small country, we know each other all too well. That being the case, how

can we judge each other while remaining objective? No one wants to cause pain, no one wants to tell some people that their research is outmoded, that they must turn to something else. This could change; in the United States one can resort to foreign experts to evaluate the worth of the research done by American scientists. They also "motivate" researchers with money. The American system is such that a researcher can't be a glutton for work, but if he does not work at all he is condemned. In France it is quite different. There too a considerable reorganization effort would be required. For example, we are still much too dominated by the University. Not that the university people aren't serious people--ultimately, on the whole--but the working methods and criteria are catastrophic. So that there is, at present, very good and very bad in French research. And this is not a question of the size of the country, as is often said. In the international research group Switzerland, for example, is far superior to France.

[Question] Do you still have a private life?

[Answer] Yes, in Strasbourg I have very faithful friends. I lack time, but I go to some concerts, rarely to the theater. I try to take part in sports: the ski runs in winter, skin diving in summer. And then I read. Philosophic essays or essays on the philosophy of science. Very few novels; no one has written better ones than Dostoievski, in my opinion. I am much interested in ideas, but I find that at present people don't have much to say.

[Question] No hobby, no passion? Painting, do-it-yourself?

[Answer] Research, you know, is do-it-yourself; I repair equipment, I change fuses. I'm not frustrated on that point.

[Question] Do you have any children?

[Answer] Yes, two sons and a daughter. Both my sons are in medicine, my daughter is still in high school. They have all decided not to do research. They think it requires too much work. I have no ambitions for my children. Only one thing seems to me to be important for them: that they practise, as I do, a profession that gives them pleasure.

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FRANCE

GENETIC RESEARCHER SELECTED AS POTENTIAL LEADER IN FIELD

Paris LE NOUVEL OBSERVATEUR in French 10 Oct 79 p 67

[Excerpt] In his laboratory at the Strasbourg Medical School there is a man of legendary tantrums who is fighting like a devil so that France will not miss this great turning point. He is Pierre Chambon, a rising star in French science, who works 12 hours a day--except Sunday--with the tyrannical fervor of the great researchers. His field: genetic manipulation.

With the team of Philippe Kourilsky, head of research at the CNRS, his Strasbourg laboratory was able to cause a common intestinal bacterium, B. coli, to manufacture a protein of great size--chicken-egg albumin. A giant step in genetics because never, until now, had such a large molecule been produced by a microbe. "I am convinced," says Pierre Chambon, "that our research will make it possible to understand, where medicine is concerned, the phenomena of carcinogenesis or malformation." And, with a smile, "To say that we are going to change the mentality or behavior of men is science fiction! We are handling dynamite, certainly, but what are the researchers who work on the atom doing?"

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FRANCE

GENETIC RESEARCH IN PROGRESS AT PASTEUR INSTITUTE

Paris LE NOUVEL OBSERVATEUR in French 24 Sep 79 pp 48-49

[Article by Josette Alia: "The Biologists' Great Fever"]

[Excerpts] It is in the test tubes that biologists are juggling genes and blending the cells that are preparing our future. Josette Alia opens the file on "genetic manipulations," also presented on Antenna 2 on Monday 24 September at 2035, in a broadcast by Pierre Champetier, produced by Igor Barrere for Jean-Pierre Elkabbach's "Question of Time."

At the Pasteur Institute, a huge steel tank is rocking gently, making a noise like a washing machine; millions of bacteria are being grown in it, modified by the hand of man. Has a little package from Germany been received, containing mouse DNA [deoxyribonucleic acid]? "And what do you see on that plate?" a young woman asks her sweatered neighbor. He leans over, stops pouring the contents of a flask marked R 902, with a fat blue syringe, into a flask marked X 658. He looks, he understands, he explains. To me it is Chinese. A little mouse calmly slips between my feet and slips under the door. It seems perfectly normal, perfectly right. Is it?

In this banal atmosphere, in this lab which wishes to remain anonymous, they are, however, on the point of penetrating several ultimate secrets of our human cells. Researchers do not talk about it willingly; this world is too familiar to them to seem foreign to them. They no longer like laymen to talk about it; they are working on a myth, life. Then, to reassure and protect themselves, they dismiss the sensational, the emotional, the shocking image. They persuade themselves that this basic throbbing, this shuddering that comes from the depths of the ages is merely a weak chemical reaction or an astute assembling of amino acids.

These genetic manipulations*, however, are not new. They first followed an earlier path, that of somatic genetics, which consists of working rather grossly at cell level.

*We employ the word "manipulation" here in its broadest sense, that is to say, to designate all artificially-created genetic actions or reactions.

Finally--and especially--they are trying to clone the miracle medicine, interferon. Every cell invaded by viruses secretes this interferon naturally, and it is the first natural barrier against the multiple viral disorders--from flu to certain cancers. But no one knows yet either how to extract it, or reproduce it, or purify it in large quantities. It is known to be there, that is all. What a victory, if one could cause it to be manufactured by obliging microbes! And that victory could be near. At the Pasteur Institute they even believe it to be within reach.

But there are less spectacular and more important prospects: the possible applications for agriculture. At the INRA [National Institute for Agronomic Research] fantastic experiments are taking place. German and Danish geneticists have produced a "pomate"--an apple-tomato hybrid--which at the moment has no taste--but who knows whether it will tomorrow? They are performing cloning on tobacco, carrots and many other species. The carnations of Nice are being saved from death.

As for the agro-food industry, it simply hopes to take on real power in the world, with the help of genetics. It can only dream of the role already being played in the United States by the diplomacy of wheat or the diplomacy of soy. In France, BSN [expansion unknown], which is prudent, envisages reconverting its plate glass industry into agro-food.

It is obvious where the danger lies: at the intersection of two roads which are parallel at present, somatic genetics and molecular genetics. Then there is danger of heading toward a dramatic uniformization of the human pattern, a disappearance of the fruitful differences. Fruitful because the "bad" genes themselves may have a secret usefulness: the diabetes gene might be a protection, a precaution for the organism in anticipation of the lean-year periods of our ancestors, which may come again. Fruitful because by selecting, they are remarkably impoverishing genetic variability, that is, all the sources of different genes that can be found in a species. It would be necessary, then, very soon (starting now, in fact) to think about forming "banks" of genes, of seed. "The countries that will not have their own reserves of animal or vegetable genes will be in danger of falling into a serious dependency," says Max Rives, head of the Department of Genetics and Plant Improvement at the INRA. "The United States is already refusing to communicate a certain beet procedure, because they have protective legislation in place."

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FRANCE

RESEARCH IN ANIMAL GENETICS AT INRA

Paris LE NOUVEL OBSERVATEUR in French 8 Oct 79 p 61

[Text] "Is this a joke, or what?" In his lab at the National Institute for Agronomic Research (INRA) in Toulouse, among his computers and listings, Bernard Bibe cannot believe the press can be interested in his research. Although he is unfashionable, this unknown is nevertheless in the process of changing the future of agriculture--and of French cooking, too.

Why? Because he is silently preparing, with other researchers, a veritable genetic revolution in France's cattle and sheep. The entire thought process of this former Agro student is part of a dual statement: 1. "To produce healthy and profitable cattle, agriculture has standardized its livestock and is now marketing animals that are very often swollen with water;" 2. "Of good quality but not productive enough, the traditional races are on the way to disappearing." And the land of their choice, which is usually unadapted to "modern" cattle raising, is dying.

With clever combinations of crossbreeds, Bernard Bibe is working himself into the ground to improve the productivity of threatened bovine races--the Gascon or the Aubrac--and of several ovine races of the Pyrenees. By saving them from extinction he will breathe new life into several regions of France. And give everyone good milk and good meat.

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INTERNATIONAL PHARMACEUTICAL CONFERENCE ON GENETICS

Paris LE FIGARO in French 17 Sep 79 p 9

[Introduction by M. V. to article by Jean Frezal: "Genetics in our Lives"]

[Text] The 29th Paris International Pharmaceutical Meeting is to be held in Paris at the School of Pharmacy, beginning this morning and lasting until 21 September. The organizers--the chairman of the meeting and Dr Marc Chambon--have chosen a theme about which the least that can be said is that it is topical: "Genetics in our Lives." Genetic manipulations, genetic anomalies induced by irradiation, mitogenesis and medication, pharmacogenetics, genetics of superior vegetables, genetics of populations--so many themes that feed reflection, philosophic and political debates, or salon conversations. Other themes, especially genetic consultations, are in more direct contact with immediate medical reality. This is what Professor Jean Frezal will talk about; he indicates here the importance--and the limits--of this vast subject.

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